CONNECTING THE CCSS-M & SMARTER BALANCED ASSESSMENT

Implications for Instruction: Part I

Smarter Balanced Content Specifications: Creating a Bridge Between Standards, Assessment, and Instruction

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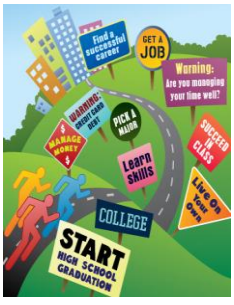
Documents we will be using:



- **Common Core State Standards for Mathematics**

http://www.sde.idaho.gov/site/common/math/docs/CCSSI_Math_Standards.pdf

- **SBAC Draft Math Content Specifications**

http://www.smarterbalanced.org/wordpress/wp-content/uploads/2011/12/Math-Content-Specifications.pdf

- **SBAC Draft Mathematics Achievement Level Descriptors & College Readiness Policy**

http://www.smarterbalanced.org/achievement-level-descriptors-and-college-readiness/

- **Cognitive Rigor Matrix Article (Hess, Carlock, Jones, and Walkup)**

http://schools.nyc.gov/NR/rdonlyres/D1061 25F-FFF0-420E-86D9-2547616 38C6F/0/HessArticle.pdf

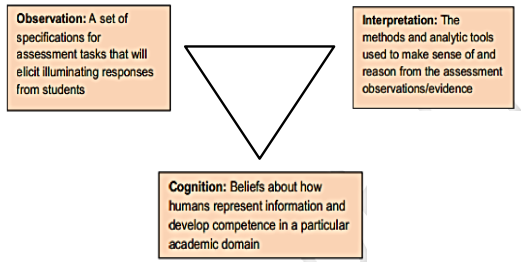
Content Specifications

1. Create a bridge between standards, assessment, and **instruction**
2. Organize the standards around major constructs and big ideas
3. Express what students should learn and be able to do

Content Specification Claims (p. 18)

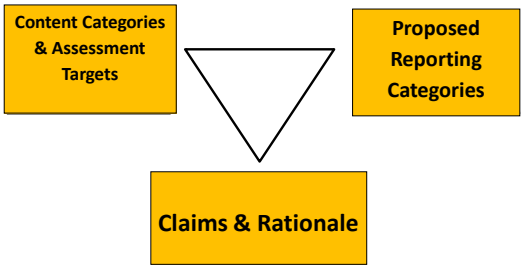
Claims are the broad statements of the assessment system's learning outcomes, each of which requires *evidence* that articulates the types of data/observations that will support interpretations of competence towards achievement of the claims.

Evidence-Centered Design



The Assessment Triangle (NRC, 2001)

The Assessment Triangle as Represented in the Content Specifications (pp. 14-15)



The Assessment Triangle (NRC, 2001)

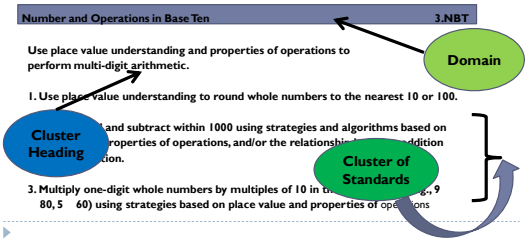
Content Specifications
Mathematics

Claims & Assessment Targets

How to read the grade level standards

Standards – p. 5

- Standards define what students should understand and be able to do.
- Clusters are groups of related standards. Note that standards from different clusters may sometimes be closely related, because mathematics is a connected subject.
- Domains are larger groups of related standards. Standards from different domains may sometimes be closely related.



Standards for Mathematical Practices

Standards pp. 6 - 8

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics
- Use appropriate tools strategically.
- Attend to precision.
- Look and make use of structure.
- Look for and express regularity in repeated reasoning

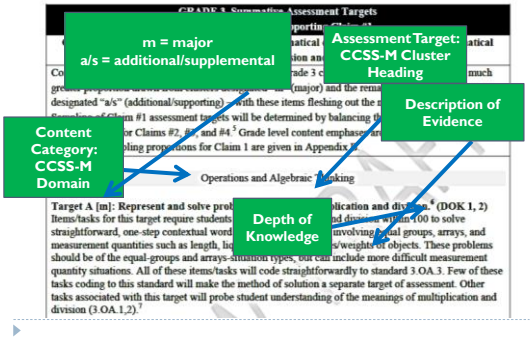
Math Claims

Content Specifications, p. 25

Claim #1	**Concepts & Procedures** "Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency."
Claim #2	**Problem Solving** "Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem solving strategies."
Claim #3	**Communicating Reasoning** "Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others."
Claim #4	**Modeling and Data Analysis** "Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems."

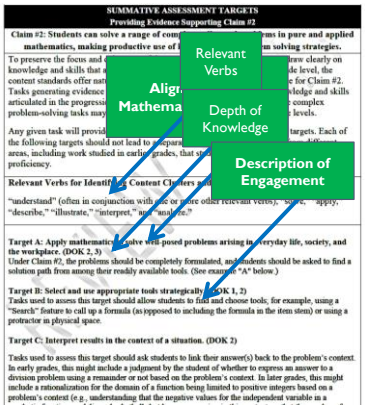
Claim 1 - Assessment Targets

Content Specifications, p. 30

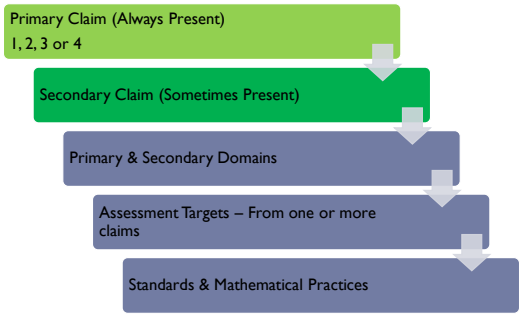


Claims 2, 3, & 4 – Assessment Targets

Content Specifications, p. 59



Item Development: Content Specifications



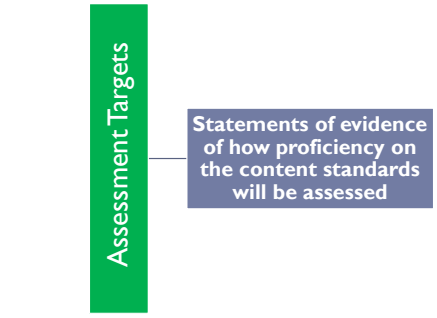
Claims 2, 3, & 4: Relevant Verbs

Problem Solving	Communicating Reasoning	Modeling & Data Analysis	
Claim 2	Claim 3	Claim 4	
Understand	Understand	Model	Summarize
Solve	Explain	Construct	Represent
Apply	Justify	Compare	Solve
Describe	Prove	Investigate	Evaluate
Illustrate	Derive	Build	Extend
Interpret	Assess	Interpret	Apply
Analyze	Illustrate	Estimate	
	Analyze	Analyze	

Assessment Targets

What are the implications for instruction?

Implications for Instruction



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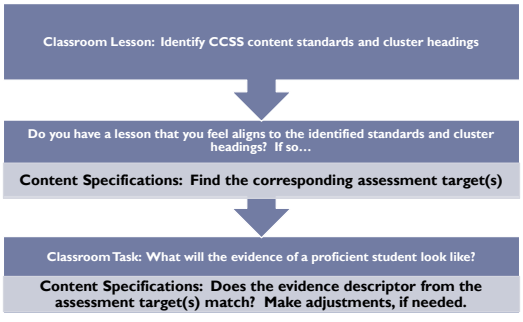

Content Specifications

Depth of Knowledge (DOK): Cognitive Rigor Matrix

Cognitive Rigor Matrix p. 92-93

A "Snapshot" of the Cognitive Rigor Matrix (Hess, Carlock, Jones, & Walkup, 2009

Type of Thinking (Revised Bloom)	Depth of Thinking (Webb) DOK Level 1 Recall & Reproduction	DOK Level 2 Basic Skills & Concepts	DOK Level 3 Strategic Thinking & Reasoning	DOK Level 4 Extended Thinking
Remember	-Recall conversions, terms, facts			
Understand	-Evaluate an expression -Locate points on a grid or number on number line -Solve a one-step problem -Represent math relationships in words, pictures, or symbols	- Specify, explain relationships -Make basic inferences or logical predictions from data/observations -Use models /diagrams to explain concepts -Make and explain estimates	-Use concepts to solve non-routine problems -Use supporting evidence to justify conjectures, generalize, or connect ideas -Explain reasoning when more than one response is possible -Explain phenomena in terms of concepts	-Relate mathematical concepts to other content areas, other domains -Develop generalizations of the results obtained and the strategies used and apply them to new problem situations
Apply	-Follow simple procedures -Calculate, measure, apply a rule (e.g., rounding) -Apply algorithm or formula -Solve linear equations -Make conversions	-Select a procedure and perform it -Solve routine problem applying multiple concepts or decision points -Retrieve information to solve a problem -Translate between representations	-Design investigation for a specific purpose or research question - Use reasoning, planning, and supporting evidence -Translate between problem & symbolic notation when not a direct translation	-Initiate, design, and conduct a project that specifies a problem, identifies solution paths, solves the problem, and reports results
Analyze	-Retrieve information from a table or graph to answer a question -Identify a pattern/trend	-Categorize data, figures -Organize, order data -Select appropriate graph and organize & display data -Interpret data from a simple graph -Extend a pattern	-Compare information within or across data sets or texts -Analyze and draw conclusions from data, citing evidence -Generalize a pattern -Interpret data from complex graph	-Analyze multiple sources of evidence or data sets
Evaluate			-Cite evidence and develop a logical argument -Compare/contrast solution methods -Verify reasonableness	-Apply understanding in a novel way, provide argument or justification for the new application
Create	- Brainstorm ideas, concepts, problems, or perspectives related to a topic or concept	-Generate conjectures or hypotheses based on observations or prior knowledge and experience	-Develop an alternative solution -Synthesize information within one data set	-Synthesize information across multiple sources or data sets -Design a model to inform and solve a practical or abstract situation

Cognitive Rigor Matrix – Karin Hess

- http://vimeo.com/20998609

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What is the distance between (0, 0) and (8, 15) on the *xy*-coordinate plane?

A 7 units
B 8 units
C 17 units
D 23 units

Cognitive Rigor Matrix

(3,1) Bloom – 3, Webb - 1
Apply algorithm or formula

Level 1: Recall & Reproduction

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Smarter Balanced Assessment Consortium

Grade 08 Mathematics Sample CR Item C1 TH

In right triangle *ABC*, side *AC* is longer than side *BC*. The boxed numbers represent the possible side lengths of triangle *ABC*.

7 8
15 17
18 20
24 25

not drawn to scale

Identify three boxed numbers that could be the side lengths of triangle *ABC*. Enter the number you chose to represent the length of each side.

1a. *BC* = ☐
1b. *AC* = ☐
1c. *AB* = ☐

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Evaluate				
Create	- Brainstorm ideas, concepts, problems, or perspectives related to a topic or concept			

(3, 2) Bloom – 3, Webb – 2
Solve routine problem applying multiple concepts or decision points.

Level 2: Basic Skills & Concepts

Cognitive Rigor Matrix

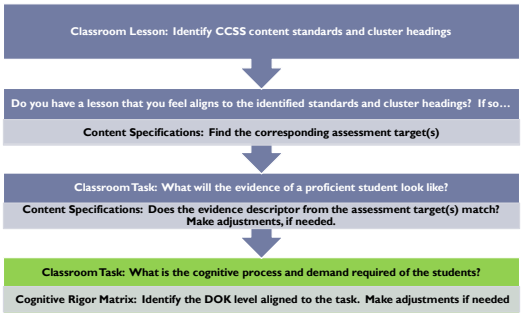
What are the implications for instruction?

Implications for Instruction

Cognitive Rigor Matrix

- How Bloom's Taxonomy and Webb's DOK are alike, yet different.
- Examination of the DOK required for different tasks
- Categorization of select assignments and learning activities
- SB test design and item development process

Implications for Instruction

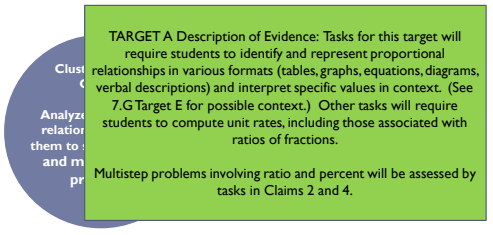


Lesson Planning Example

Using the Content Specifications

Cluster Headings, Claims, & Assessment Targets

Cluster Headings, Claims, & Assessment Targets



Looking at current lessons….

A rate is a form of ratio in which the two terms are in different units. For example price of wheat is $2 for 3 Kgs, then the rate would be $2 for 3 Kgs and the unit of rate would be $/Kg. Similarly if a car goes 100 miles in 1.5 hour, then the rate is 100 miles per 1.5 hour and unit is miles/hr. Note that ratios are usually unit less.

Unit rate is a rate in which the rate is expressed as a quantity of 1. Simply put is rate which has denominator of 1. For example, if a car goes 60 miles in 1 hour, then the unit rate is 60 miles per hour. Other examples are $5 per Kg, 5 mt per second and $80 per barrel.

Unit price is the rate when it is expressed in unit currency like dollar or cent. An example is price of corn is $2 per ounce and price of petrol is $5 per gallon. Remember that the price is always the numerator and the unit is the denominator.

Converting rate to unit rate/price
Rate can be converted to unit rate simply by dividing the first term by second term. Consider an example:

Q1. If a car travels 45 miles in 30 min, what is the rate at which the car is travelling?

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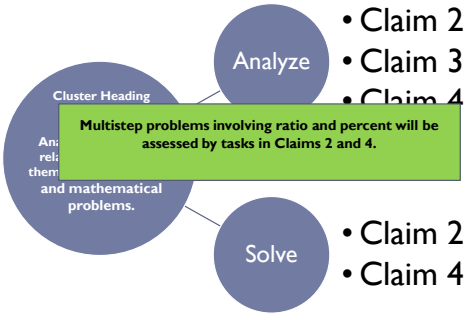
te
which has de
unit
rate is 60 mil
per
barrel.
Unit price is
example is pr
Remember th
Converting
Rate can be c
n.
Consider an
Q1. If a car travels 45 miles in 30 min, what is the rate at which the car is travelling?

Standard 7.RP.1: Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 1/2 1/4 miles per hour, equivalently 2 miles per hour.

Making adjustments or extending…

- Travis was attempting to make muffins to take to a neighbor that had just moved in down the street. The recipe that he was working with required ¾ cup of sugar and 1/8 cup of butter.
- Travis accidentally put a whole cup of butter in the mix.
  - What is the ratio of sugar to butter in the original recipe? What amount of sugar does Travis need to put into the mix to have the same ratio of sugar to butter that the original recipe calls for?
  - If Travis wants to keep the ratios the same as they are in the original recipe, how will the amounts of all the other ingredients for this new mixture compare to the amounts for a single batch of muffins?
  - The original recipe called for 3 8 cup of blueberries. What is the ratio of blueberries to butter in the recipe? How many cups of blueberries are needed in the new enlarged mixture?
- This got Travis wondering how he could remedy similar mistakes if he were to dump in a single cup of some of the other ingredients. Assume he wants to keep the ratios the same.
  - How many cups of sugar are needed if a single cup of blueberries is used in the mix?
  - How many cups of butter are needed if a single cup of sugar is used in the mix?
  - How many cups of blueberries are needed for each cup of sugar?
- Commentary:
  While the task as written does not explicitly use the term "unit rate," most of the work students will do amounts to finding unit rates. A recipe context works especially well since there are so many different pair-wise ratios to consider.

Cluster Headings, Claims, & Assessment Targets



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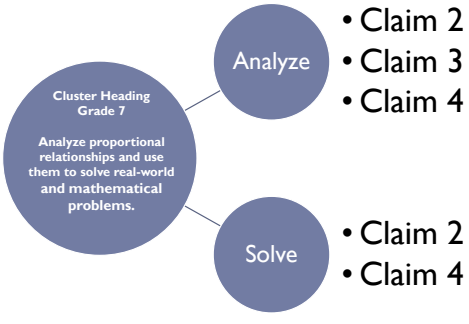

Cluster Headings, Claims, & Assessment Targets

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Multistep problems involving ratio and percent will be assessed by tasks in Claims 2 and 4.

Claim 2: Problem Solving

Target A: Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace. (DOK 2, 3)

Claim 4: Modeling & Data Analysis

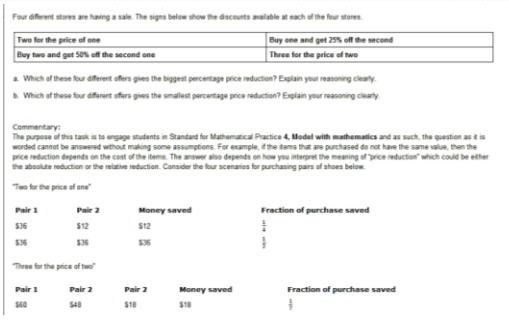
Target F: Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas). (DOK 1, 2, 3)

Looking at current lessons….

- **Find the sale price, retail price, or total meal cost.**

- **1.** Original price: **$20**
  Discount: **30%**
- **2.** Original price: **$80**
  Discount: **10%**
- **3.** Wholesale price: **$30**
  Percent markup: **120%**
- **4.** Wholesale price: **$85**
  Percent markup: **20%**
- **5.** Food bill: **$55**
  Tip: **18%**
- **6.** Food bill: **$38.40**
  Tip: **15%**

Making adjustments or extend…



Four different stores are having a sale. The signs below show the discounts available at each of the four stores.

Two for the price of one	**Buy one and get 25% off the second**
Buy two and get 50% off the second one	**Three for the price of two**

a. Which of these four different offers gives the biggest percentage price reduction? Explain your reasoning clearly.

b. Which of these four different offers gives the smallest percentage price reduction? Explain your reasoning clearly.

Commentary:
The purpose of this task is to engage students in Standard for Mathematical Practice **4, Model with mathematics** and as such, the question as it is worded cannot be answered without making some assumptions. For example, if the items that are purchased do not have the same value, then the price reduction depends on the cost of the items. The answer also depends on how you interpret the meaning of "price reduction" which could be either the absolute reduction or the relative reduction. Consider the four scenarios for purchasing pairs of shoes below.

"Two for the price of one"

Pair 1	Pair 2	Money saved	Fraction of purchase saved
$36	$12	$12	$\frac{1}{4}$
$36	$36	$36	$\frac{1}{2}$

"Three for the price of two"

Pair 1	Pair 2	Pair 3	Money saved	Fraction of purchase saved
$60	$48	$18	$18	$\frac{1}{5}$

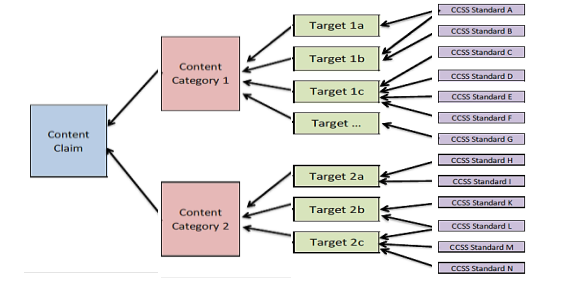
Lesson Plan Resources

- Illustrative Mathematics
  - http://www.illustrativemathematics.org/
- MARS
  - http://map.mathshell.org/materials/index.php
- NY Office of Assessment
  - http://www.p12.nysed.gov/apda/common-core-sample-questions/
- EduCore
  - http://educore.ascd.org/
- NCTM's Illuminations
  - http://illuminations.nctm.org/

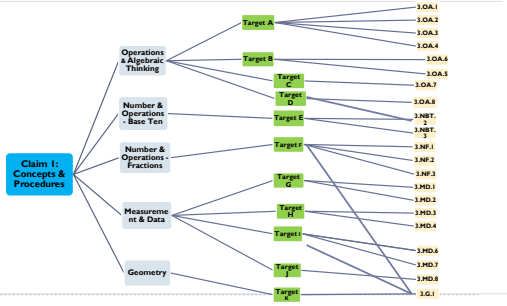
Initial Achievement Level Descriptors & College Readiness Policy

Claims, Assessment Targets & Achievement Level Descriptors

Relationship among Content Claims, Content Categories, Assessment Targets, and Standards (p.8)



GRADE 3: Relationship among Content Claims, Content Categories, Assessment Targets, and Standards



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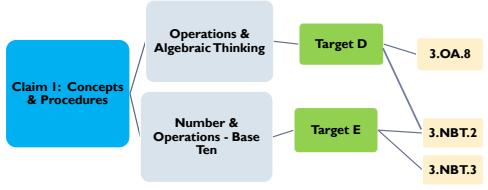
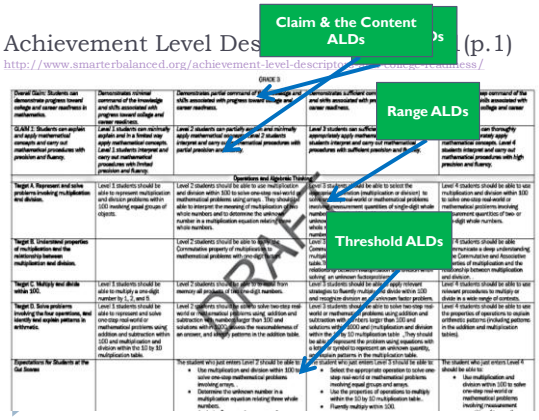


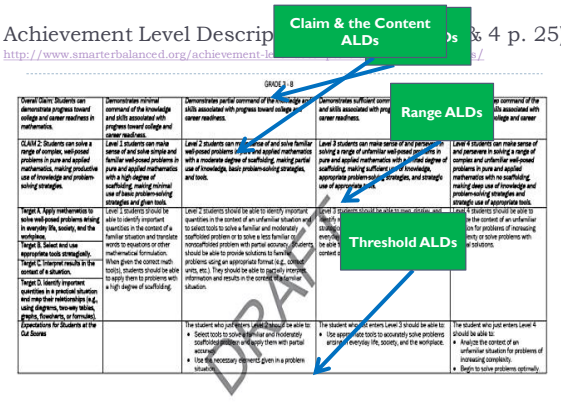
Achievement Level Des… (p.1)

http://www.smarterbalanced.org/achievement-level-descript…college-readiness/



Achievement Level Descrip… & 4 p. 25)

http://www.smarterbalanced.org/achievement-le…



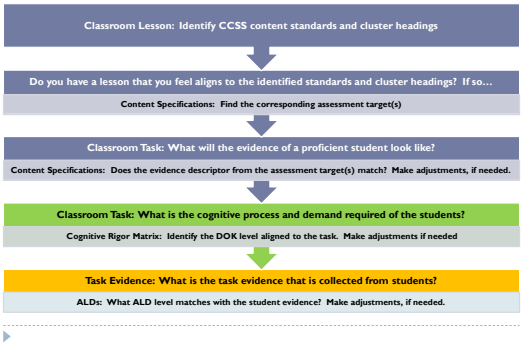
Achievement Level Descriptors

http://www.smarterbalanced.org/achievement-level-descriptors-and-college-readiness/

Achievement Level Descriptors (ALDs)

What are the implications for instruction?

Implications for Instruction



Where to go from here…

Instructional Implications

Next Steps

- Become more familiar with all of the documents discussed today.
- Begin using the documents and the identified implications for instruction when adjusting current activities, lessons, or units to meet the rigor of the CCSS.
- Visit the websites provided to view sample lesson plans and assessments.

Evaluation

- Please complete a survey on your experience in participating in Connecting the CCSS-M and Smarter Balanced Assessment, Implications for Instruction: Part I.
  - *You feedback is greatly appreciated and is used to make adjustments in future trainings!*
- To access the survey, please visit, https://www.surveymonkey.com/s/CCSSMSBA
  - *Thank you for taking time out of your busy schedule to participate in today's webinar!*

Connecting the CCSS-M & the Smarter Balanced Assessment: Part II

Thursday – February 7, 2013,
3:30PM to 5:00 PM (MST)

- Smarter Balanced Item & Task Specifications as defined by the Mathematics Content Specifications

Future Module

- *ELA/Literacy Content Specifications and Related Documents*

Presented by:

Diann Roberts – ELA/Literacy Coordinator
Nancy Thomas Price – Formative & Interim Assessment Coordinator

Questions

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